
# The Decadal Survey Aerosol and Cloud-Convection-Precipitation (A-CCP) Observing System Implementation Study

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# 2017 NASA Decadal Survey

- 2017-2027 Earth Science Decadal Survey (DS) released in January 2018
- Identified the main science and applications priorities to be pursued rather than recommending specific missions (as with the 2007-2017 DS).
- Five panels:
  - Global hydrological cycles and water resources
  - Weather and air quality
  - Marine and terrestrial ecosystems and natural resource management
  - Climate variability and change
  - Earth surface and interior

# DS Recommendations

- Identified 35 key science/applications questions (out of hundreds suggested), with highest priority to
  - Coupling of the water and energy cycles
  - Ecosystem change
  - Extending & improving weather & air quality forecasts
  - Sea level rise
  - Reducing climate uncertainty & informing societal response
  - Surface dynamics, geological hazards and disasters
- Recommended augmentation of the Program of Record (PoR) with eight priority observables
  - Aerosols
  - Clouds, convection, & precipitation (CCP)
  - Mass change
  - Surface biology and geology
  - Surface deformation and change
  - 3 others to be selected competitively from among 6 candidates

# A & CCP Designated Mission(s) For Targeted Observables

| Targeted Observable | Science/Applications Summary | Candidate Measurement Approach | Designated | Explorer | Incubation | |
|---|---|---|---|---|---|---|
| **Aerosols** | **Aerosol properties, aerosol vertical profiles, and cloud properties** to understand their effects on climate and air quality | Backscatter lidar and multi-channel/multi-angle/polarization imaging radiometer flown together | X | | | ≤$800M |
| **Clouds, Convection, and Precipitation** | **Coupled clou** **dynamics** for monitoring global hydrological cycle and understanding contributing processes including cloud feedback | passive microwave and sub-mm radiometer | X | | | ≤$800M |
| **Mass Change** | **Large-scale Earth dynamics** measured by the changing between the E ground water, and ice sheets | Spacecraft ranging measurement of | X | | | ≤$300M |
| **Surface Biology and Geology** | **Earth surface geology and biology,** ground/water active geolog and algal biomass | Hyperspectral imagery in the visible thermal IR | X | | | ≤$650M |
| **Surface Deformation and Change** | **Earth surface dynamics** from earthquakes and landslides | Interferometric Synthetic Aperture correction | X | | | ≤$500M |

Transition to missions in 2020-2022 time frame

Transition to missions in 2023-2027 time frame

Transition to missions in 2020-2022 time frame

Transition to missions in 2023-2027 time frame

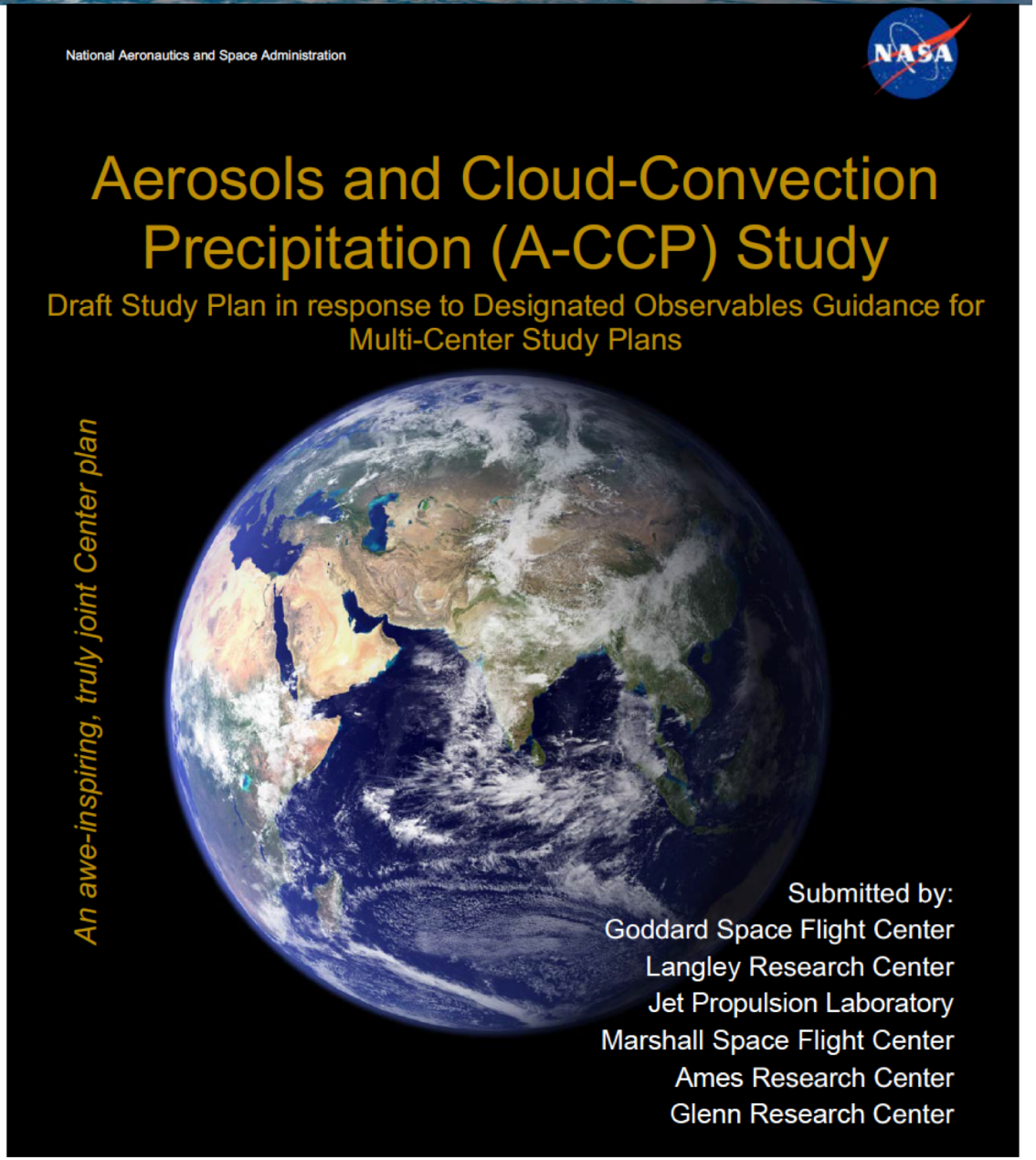
# Designated Observable Observing Systems

- Cost-capped medium- and large-size missions
- Budget includes all costs (instruments, spacecraft, mission operations, launch, science team, ground validation, etc.)
- Instruments will be competed, spacecraft procured rather than built in-house.

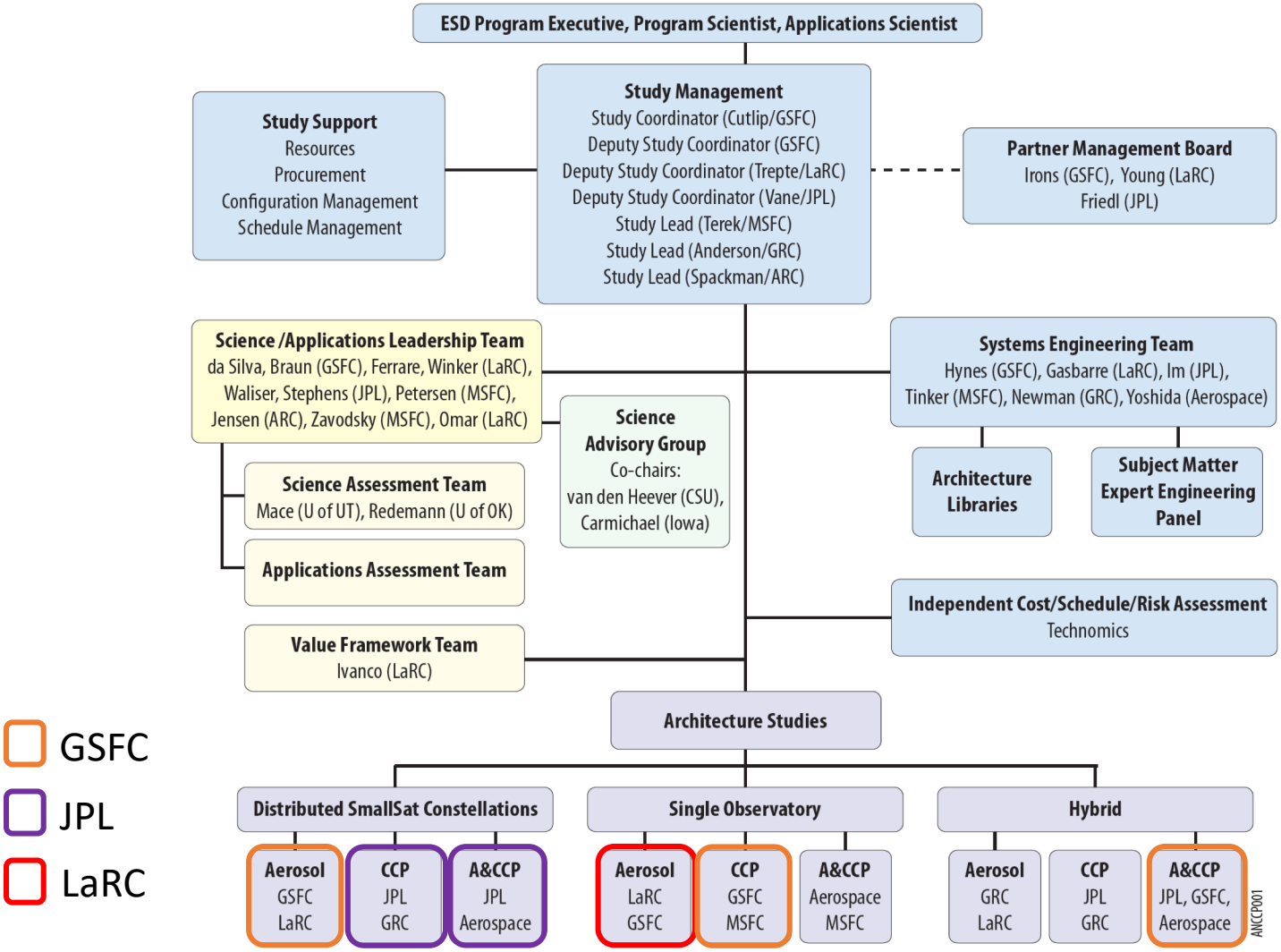
# HQ Call for Study Proposals

- June 1: Call for study proposals, due July 16
- Focus on first two sets of observables: Surface Biology and Geology (SBG), Aerosols/CCP, Mass Change, and Surface Deformation and Change
- Had to be multi-NASA center
- Spacecraft and instruments: Look for partner contributions, instruments to be competed, spacecraft from industry, examine the PoR
- Should examine non-traditional architectures
- Should keep trade space open as long as possible

# A-CCP Study Plan in process of being refined



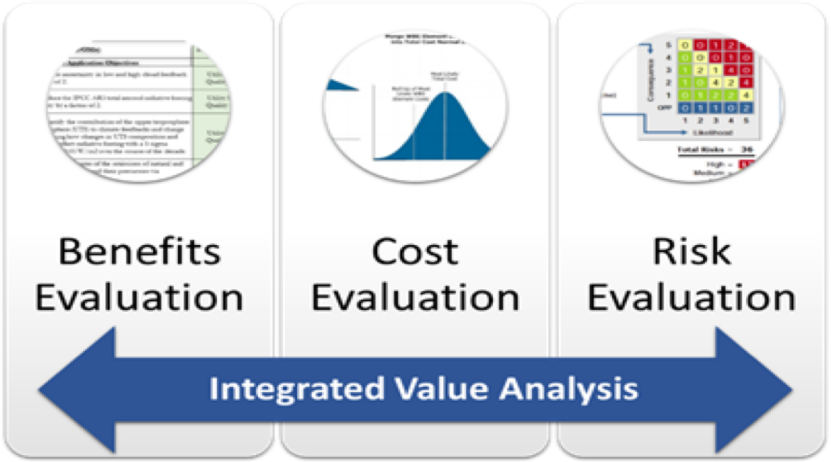
# A-CPP Organization and Activities



# Assessing Architecture Value

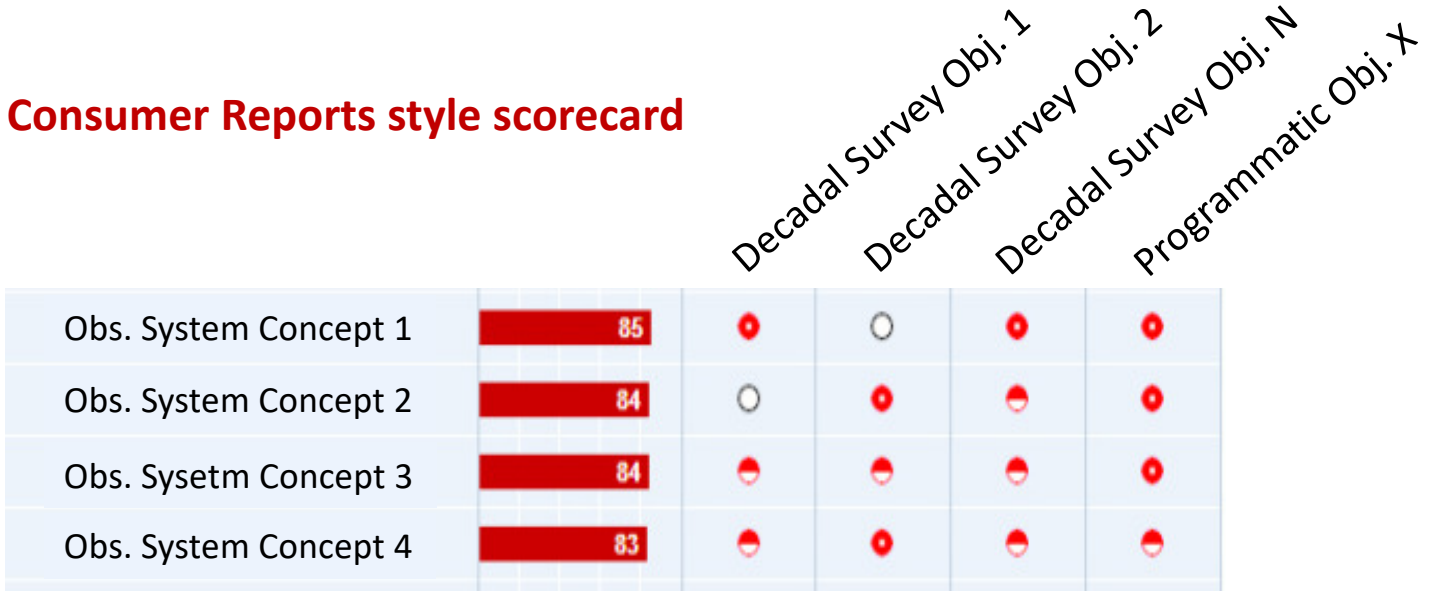
The Value Framework Team led by Marie Ivanco (NASA Systems Analysis and Concepts Directorate)
Role: To provide an objective assessment of the scientific value of proposed observing system architectures

Value defined by the SALT in terms of ***utility*** of observables for addressing science and applications objectives and the ***quality*** of the observable



# Value Framework Scorecards (a notional form of a scorecard)

**Consumer Reports style scorecard**



# A-CCP Study Activities and Rough Schedule

- Define and refine the A, CCP, and A+CCP Science And Applications Traceability Matrices (SATMs) by ~March 2019
  - Describes the mission objectives, required geophysical variables, measurement requirements (type of measurement/technology, sensitivity, accuracy, resolution, etc.) and mission requirements (orbit, altitude, etc.).
- Assign utility scores for each observable, quality scores for each potential sensor making that observation (~March 2019-March 2020)

# A-CCP Study Activities and Rough Schedule

- Examine the Program of Record (PoR)
  - Current or future known observing systems (e.g., GOES, JPSS, GPM, other partner missions)
- Architectures should take advantage of the PoR to the extent possible
- Assess costs for using PoR data
  - Modifications of formats, algorithms
  - Calibration/intercalibration
  - Data storage and processing

# A-CCP Study Activities and Rough Schedule

- Explore partnerships
- Partnerships can enhance capabilities (contributed instruments, PoR data access, suborbital or GV activities, other science improvements) and reduce costs (e.g., provided launch)
- Potential partnerships are being managed by NASA HQ
  - Program Scientist: Hal Maring
  - Alternate PSs: Gail Skofronick-Jackson and Barry Lefer

# A-CCP Study Activities and Rough Schedule

- Development of instrument libraries that contain information on instrument capabilities and requirements ~April 2019
- FY19 will include 6 architecture studies, with additional studies planned in FY20 and possibly FY21
  - Observing systems can include spacecraft, airborne, balloon/dirigible, and ground measurements
- Study report due near end of 2021, with possible Key Decision Point-A phase beginning April 2022